

## PATENT ABSTRACTS OF JAPAN

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(71)Applicant : MATSUSHITA ELECTRIC WORKS  
LTD

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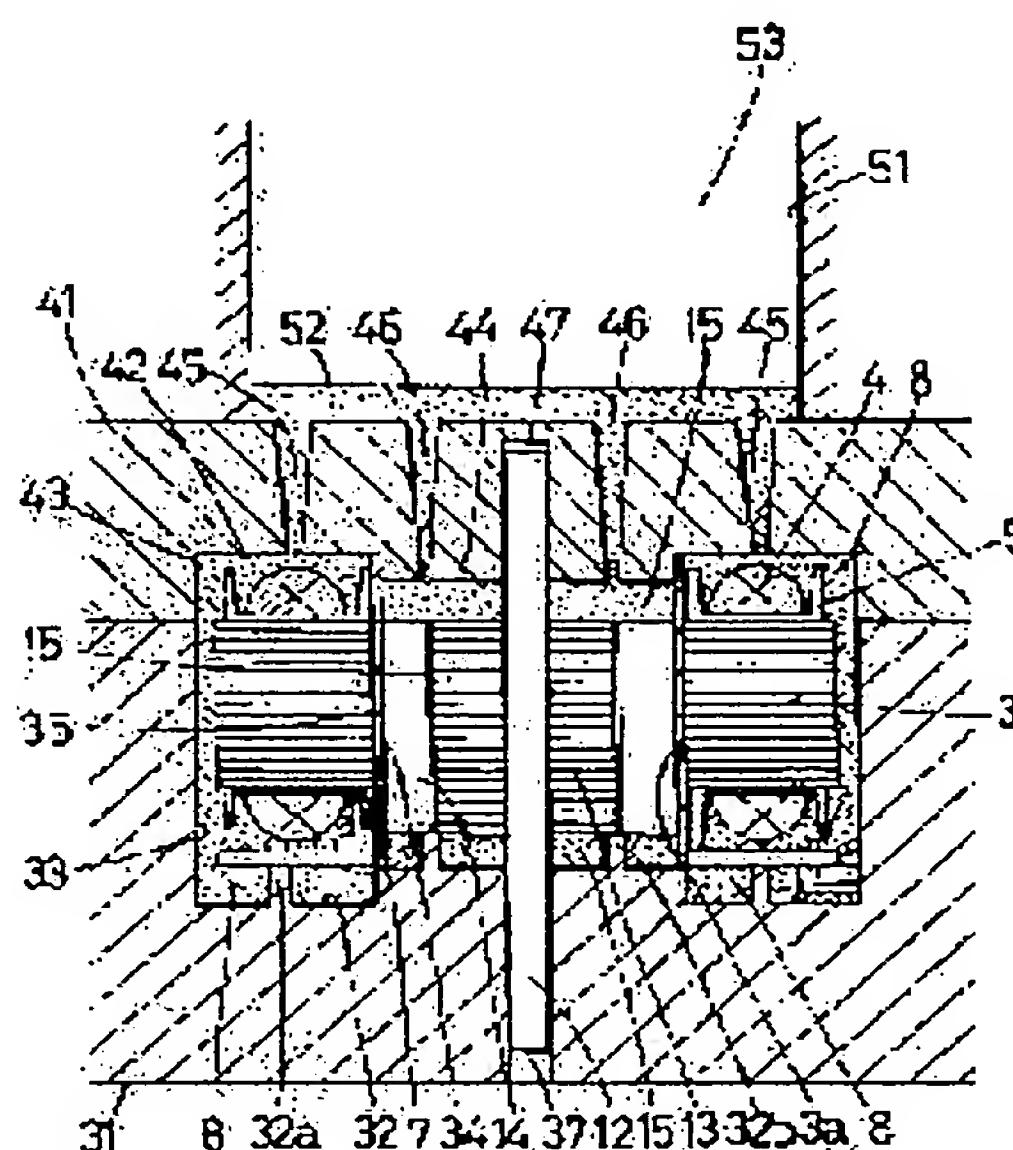
(72)Inventor : KAWAMOTO TETSUO  
ISHIDA YOSUKE

## (54) BRUSHLESS MOTOR AND MOLD THEREOF

## (57)Abstract:

PURPOSE: To provide a brushless motor and a mold thereof in which manufacturing steps of a rotor block and the entire motor are simplified and structural reliability is enhanced.

CONSTITUTION: A motor has a rotor block 11, a yoke 13, a segment magnet 14, and a resin layer 15 formed between both axial end faces of the yoke 13 and the magnet 14 to fix the magnet to the yoke. A mold has a lower mold 31 which has an inner peripheral wall 34 corresponding to an outer periphery of the block and a thin cylinder 33 having a thickness corresponding to a gap between a pole element 3 and the outer periphery of the block and stood from a bottom 32.



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CLAIMS

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[Claim(s)]

[Claim 1] The stator which protruded two or more magnetic pole children on inner skin while piercing and carrying out the laminating of the griddle and making the shape of a profile cylinder, The electric wiring plate which makes support connection of the terminal of the coil wound around this magnetic pole child's perimeter, and a magneto induction component and a coil, With an implication and stator Brock who is made to expose a magnetic pole child's inner skin, and comes to carry out the method resin mold of a wrap of these Two or more segment magnets which fix on the periphery of a rotor axis, York of the shape of a cylinder which fixed on the periphery of a rotor axis, and this York, In the brushless electric motor which has rotator Brock who becomes more, and the bearing stand which has the bearing which supports a rotor axis and is fixed to stator Brock's shaft-orientations both ends said rotator Brock The brushless electric motor characterized by having formed the resin layer between York and the direction both-ends side of a segment magnetic axis and York, and a segment magnet, and fixing a segment magnet to York.

[Claim 2] The pars basilaris ossis occipitalis corresponding to the shaft-orientations end side of stator Brock and rotator Brock, The thin cylinder object which has the way peripheral wall section, and has the thickness corresponding to the gap between the peripheral faces of a magnetic pole child and rotator Brock, and was set up from the pars basilaris ossis occipitalis while corresponding to the method peripheral wall section of outside corresponding to stator Brock's peripheral face, and rotator Brock's peripheral face, The female mold provided and the pars basilaris ossis occipitalis corresponding to the shaft-orientations other end side of stator Brock and rotator Brock, The method peripheral wall section of outside corresponding to stator Brock's peripheral face, and the method injected hole of outside prepared in the range in which stator Brock exists in the direction of a path, Shaping metal mold which possesses a way injected hole while preparing in the range in which rotator Brock exists in the direction of a path, has the punch which formed in the pars basilaris ossis occipitalis the fitting projected part into which a thin cylinder object fits, pours in resin from both injected holes, and transfer-molds a brushless electric motor according to claim 1.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the brushless electric motor and pan which have rotator Brock by whom an enclosure is done to this with stator Brock by which resin mold was carried out at the shaping metal mold of that.

[0002]

[Description of the Prior Art] In recent years, what carried out the resin mold of stator Brock for silence of a brushless electric motor is increasing. Such a brushless electric motor and its shaping metal mold have the common configuration shown in drawing 7 and drawing 8 , and a brushless electric motor is stator Brock 1. The bearing stand 21 is used as the main configuration member with rotator Brock 11.

[0003] stator Brock 1 while piercing and carrying out the laminating of the griddle and making the shape of a profile cylinder -- magnetic pole child 3 of plurality [ inner skin ] Stator 2 which protruded This magnetic pole child 3 It is an insulating member 5 to a perimeter. Coil 4 wound by minding Magneto induction component 7 Coil 4 Electric wiring plate 6 which makes support connection of the terminal It contains and he is the magnetic pole child 3. Inner skin 3a is exposed and it is the resin layer 8 about these. It comes to carry out the method resin mold of a wrap. resin layer 8 \*\*\*\* -- attachment hole 8a of an adequate several individual is prepared, and the drive circuit board may be laid underground depending on the case

[0004] Rotator Brock 11 becomes the periphery of a rotor axis 12, York 13 of the shape of a cylinder which fixed on the periphery of a rotor axis 12, and this York 13 from two or more segment magnets 14 and 14 and - which fix by adhesion etc.

[0005] Two bearing stands 21 and 21 It has the bearing 22 which supports a rotor axis 12, and he is stator Brock 1 further. Attachment holes 8a and 8a Corresponding attachment holes 21a and 21a It has and they are both the attachment holes 8a and 21a. He is stator Brock 1 by screwing \*\*\*\* drawing outside etc. on for being made to agree. It is fixed to shaft-orientations both ends.

[0006] Stator Brock 1 who mentioned above The shaping metal mold for resin mold The pars basilaris ossis occipitalis 32 corresponding to a shaft-orientations end side, and the method peripheral wall section 33 of outside corresponding to a peripheral face, Magnetic pole child 3 Female mold 31 which possesses the way peripheral wall section 34 while inner skin 3a fitted in, The pars basilaris ossis occipitalis 42 corresponding to a shaft-orientations other end side, the method peripheral wall section 43 of outside corresponding to a peripheral face, and magnetic pole child 3 While inner skin 3a fits in, it sets in the direction of a path with the way peripheral wall section 44, and he is stator Brock 1. It has the punch 41 possessing the injected hole 45 prepared in the existing range. In the pars basilaris ossis occipitalis 32 of female mold 31, it is the resin layer 8 by the side of a shaft-orientations end side. Stanchion 32a for formation It has prepared. The pot by which 51 holds a molding material, a molding material [ like unsaturated polyester ] whose 52 is, and 53 are the plungers for extruding a molding material, therefore this shaping metal mold has metal mold structure of transfer molding.

[0007] Stator Brock 1 Shaping is the vertical metal mold 31 and 41 which charged the molding

material 52 which carried out the preheating into the pot 51, and was heated. If descent of a plunger 53 is filled up with a molding material 52 in metal mold through an injected hole 45 and it hardens while comparing by the predetermined mold clamp force, it will be the vertical metal mold 31 and 41. It opens wide and he is stator Brock 1. It takes out.

[0008] This brushless electric motor is the magneto induction component 7 about rotator Brock's 11 segment magnets 14 and 14, and the polarity of -. It detects and a drive-drawing outside circuit is a coil 4 suitably. Energization is controlled and rotator Brock 11 is rotated. And stator Brock 11 is the magnetic pole child 3. Only inner skin 3a is exposed and it is the resin layer 8 about except [ its ]. Since it is covered, the oscillating noise of itself can be reduced.

[0009]

[Problem(s) to be Solved by the Invention] Since stator Brock is formed of transfer molding, to silence, the conventional thing mentioned above is good and, moreover, turns into what has firm structure. However, for the rotator Brock, since fixing to York of a segment magnet is performed by adhesion etc., the activity is troublesome, and moreover, the fixing reinforcement is dispersion and a cone.

[0010] This invention is what was made in view of this reason, and the place made into the purpose simplifies the production process of rotator Brock or the whole motor, and is in offer of the brushless electric motor with which structural dependability is raised, and its shaping metal mold.

[0011]

[Means for Solving the Problem] In order to solve this technical problem, a brushless electric motor according to claim 1 The stator which protruded two or more magnetic pole children on inner skin while piercing and carrying out the laminating of the griddle and making the shape of a profilé cylinder, The electric wiring plate which makes support connection of the terminal of the coil wound around this magnetic pole child's perimeter, and a magneto induction component and a coil, With an implication and stator Brock who is made to expose a magnetic pole child's inner skin, and comes to carry out the method resin mold of a wrap of these Two or more segment magnets which fix on the periphery of a rotor axis, York of the shape of a cylinder which fixed on the periphery of a rotor axis, and this York, In the brushless electric motor which has rotator Brock who becomes more, and the bearing stand which has the bearing which supports a rotor axis and is fixed to stator Brock's shaft-orientations both ends said rotator Brock A resin layer is formed between York and the direction both-ends side of a segment magnetic axis and York, and a segment magnet, and the segment magnet is considered as the configuration which fixed to York.

[0012] The pars basilaris ossis occipitalis corresponding to the shaft-orientations end side of stator Brock and rotator Brock in shaping metal mold according to claim 2, The thin cylinder object which has the way peripheral wall section, and has the thickness corresponding to the gap between the peripheral faces of a magnetic pole child and rotator Brock, and was set up from the pars basilaris ossis occipitalis while corresponding to the method peripheral wall section of outside corresponding to stator Brock's peripheral face, and rotator Brock's peripheral face, The female mold provided and the pars basilaris ossis occipitalis corresponding to the shaft-orientations other end side of stator Brock and rotator Brock, The method peripheral wall section of outside corresponding to stator Brock's peripheral face, and the method injected hole of outside prepared in the range in which stator Brock exists in the direction of a path, While preparing in the range in which rotator Brock exists in the direction of a path, a way injected hole is provided, and it has the punch which formed in the pars basilaris ossis occipitalis the fitting projected part into which a thin cylinder object fits, and is considering as the configuration which pours in resin and transfer-molds a brushless electric motor according to claim 1 from both injected holes.

[0013]

[Function] Since fixing of the segment magnet to York is performed by the resin layer formed of transfer molding etc. according to the configuration according to claim 1, rotator Brock's



production process is simplified and structural dependability is raised.

[0014] According to the configuration according to claim 2, since stator Brock and rotator Brock can form in coincidence by transfer molding, the production process of the whole motor is simplified and structural dependability is raised.

[0015]

[Example] Hereafter, one example of the brushless electric motor of this invention and shaping metal mold is explained based on drawing 1 and drawing 2. In addition, the same sign is substantially given to the same member with the member of the conventional example.

[0016] This brushless electric motor is stator Brock 1 like what was explained in the conventional example. The bearing stand 21 is used as the main configuration member with rotator Brock 11, and, as for the conventional example, only rotator Brock 11 of them differs. that is, stator Brock 1 Magnetic pole child 3 of plurality [ inner skin ] Stator 2 which protruded magnetic pole child 3 a perimeter -- insulating member 5 Coil 4 wound by minding magneto induction component 7 Coil 4 Electric wiring plate 6 which makes support connection of the terminal containing -- magnetic pole child 3 inner skin 3a is exposed -- making -- these -- resin layer 8 a wrap -- it needs -- resin mold -- carrying out -- becoming -- resin layer 8 \*\*\*\* -- attachment hole 8a of an adequate several individual is prepared. Moreover, two bearing stands 21 and 21 Bearing 22 and 22 which supports a rotor axis 12 It has. Furthermore, he is stator Brock 1. Attachment holes 8a and 8a Corresponding attachment holes 21a and 21a It has. He is stator Brock 1 about rotator Brock 11 who mentions later. It inserts inside and is bearing 22 and 22 about a rotor axis 12. They are both attachment hole 8a and 21a, making it insert in. He is stator Brock 1 by screwing \*\*\*\* drawing outside etc. on for being made to agree. It is fixed to shaft-orientations both ends.

[0017] Rotator Brock 11 is plurality which fixes by adhesion etc. on the periphery of a rotor axis 12, York 13 of the shape of a cylinder which fixed on the periphery of a rotor axis 12, and this York 13. (this example four pieces) It consists of segment magnets 14 and 14 and -. The resin layer 15 is formed between York 13 and the segment magnets 14 and 14, the shaft-orientations both-ends side of -, York 13, the segment magnets 14 and 14, and -, and the segment magnets 14 and 14 and - are still more specifically considered as the configuration which fixed to York 13. Moreover, York 13 and the segment magnets 14 and 14, and the resin layers 15 and 15 prepared in the shaft-orientations both-ends side of - The included die length is stator Brock 1. Resin layers 8 and 8 prepared in the shaft-orientations both-ends side It is made a little shorter than the included die length.

[0018] Next, such stator Brock 1 The shaping metal mold for forming rotator Brock 11 is explained. Female mold 31 is stator Brock 1. And the pars basilaris ossis occipitalis 32 corresponding to rotator Brock's 11 shaft-orientations end side, Stator Brock 1 The thin cylinder object 35 which has the way peripheral wall section 34, and has the thickness corresponding to the gap between the peripheral faces of the magnetic pole child 3 and rotator Brock 11, and was set up from the pars basilaris ossis occipitalis 32 while corresponding to the method peripheral wall section 33 of outside corresponding to a peripheral face, and rotator Brock's 11 peripheral face, It has the insertion hole 37 of a rotor axis 12. The thin cylinder object 35 is stator Brock 1. It has extended to the end face, therefore projects from an abutting surface. It is not flatter than the relation of the shaft-orientations die length of both blocks 1 and 11, and the part corresponding to rotator Brock 11 has projected a few, and partes basilaris ossis occipitalis 32 are two or more stanchions 32a and 32b for the resin layer 8 by the side of a shaft-orientations end side, and formation of 15. It has prepared. It is in the condition to which the segment magnet 14 contacted the way peripheral wall section 34 among the thin cylinder objects 35, and is made for the clearance which can form the predetermined resin layer 15 among both to be generated in the design of York 13 and the segment magnet 14. Furthermore, it is stanchion 32b for rotator Brock 11. Both York 13 and the segment magnet 14 are supported.

[0019] A punch 41 is stator Brock 1. And the pars basilaris ossis occipitalis 42 corresponding to rotator Brock's 11 shaft-orientations end side and stator Brock 1 It sets in the direction of a

path with the method peripheral wall section 43 of outside corresponding to a peripheral face, and he is stator Brock 1. While preparing in the method injected hole 45 of outside prepared in the existing range, and the range in which rotator Brock 11 exists in the direction of a path, it has the way injected hole 46 and the insertion hole 47 of a rotor axis 12. A pars basilaris ossis occipitalis 42 is not flatter than the relation of the shaft-orientations die length of both blocks 1 and 11, the part corresponding to rotator Brock 11 has projected a few, and this serves as the fitting projected part 44 into which the thin cylinder object 35 fits. As for the inner direction injected hole 46, it is desirable to prepare in the location which laps with York 13 and the clearance between the segment magnets 14.

[0020] The pot by which 51 holds a molding material, a molding material [ like unsaturated polyester ] whose 52 is, and 53 are the plungers for extruding a molding material, and this shaping metal mold has metal mold structure of transfer molding. The viscosity at the time of heating melting is very low, to all the corners in metal mold, a small gap can be certainly filled up with the unsaturated polyester of a molding material 52, and its adhesion with each part material is also good.

[0021] the motor of this example -- stator Brock 1 an outer diameter -- abbreviation 100mmphi and shaft-orientations die length -- the outer diameter of about 20mm and rotator Brock 11 -- 40 thru/or 50mmphi, and shaft-orientations die length -- about 15mm and magnetic pole child 3 the gap of inner skin 3a and the segment magnet 14 -- abbreviation the thickness of the resin layer 15 between 1mm, York 13, and the segment magnet 14 -- 0.2 Or 0.3mm \*\* -- it is carrying out.

[0022] Stator Brock 1 Rotator Brock's 11 shaping Vertical metal mold 31 and 41 which charged the molding material 52 which carried out the preheating into the pot 51, and was heated While comparing by the predetermined mold clamp force Molding materials 52 are both the injected holes 45 and 46 by descent of a plunger 53. If pass, it fills up in metal mold, it fills up also between York 13 and the segment magnet 14 and they harden, it will be the vertical metal mold 31 and 41. It opens wide and both blocks 1 and 11 take out.

[0023] Thus, stator Brock 1 Since rotator Brock 11 is formed in coincidence of transfer molding, as compared with the conventional thing, the production process of rotator Brock or the whole motor is simplified, and structural dependability is raised. Moreover, since only a required number will always be fabricated, quantity management is also easy for what fabricates both blocks 1 and 11 separately, while a production process is simplified rather than it, though it thinks.

[0024] Drawing 3 and drawing 4 are rotator Brock's 11 applications, and are changing the configuration of the segment magnet 14. That is, the segment magnet 14 is excision section 14a which excised the hoop direction end face by the side of the inner circumference at the include angle of about 45 degrees although it was making 1 / 4 radii tabular. It has. This thing is excision section 14a, when a molding material 52 is poured in. By the slant face, in the method of outside, the segment magnet 14 becomes is easy to be pressed, and better shaping can be performed. Drawing 4 R> 4 (a) (b) just before a molding material 52 is poured in The condition that the segment magnet 14 is pressed with the molding material 52 by the method of outside is shown.

[0025] By rotator Brock's 11 application, drawing 5 and drawing 6 are also changing the configuration of York 13 with the configuration of the previous segment magnet 14. Namely, as for York 13, many concave streaks 13a and 13a and - are formed in the peripheral face. In this case, it is desirable to pierce and carry out the laminating of the piece of York of sheet metal. In addition, the segment magnet 14 is excision section 14a. You may not be. For the fundamental clearance between York 13 and the segment magnet 14, it is made small and this thing is that part concave streak 13a. Width of face and the depth are enlarged and a molding material 52 becomes that it is easier to make it filled up.

[0026]

[Effect of the Invention] Since fixing of the segment magnet to York is performed by the resin layer formed of transfer molding etc., a brushless electric motor according to claim 1 simplifies

rotator Brock's production process, and structural dependability is raised.

[0027] Since stator Brock and rotator Brock can form shaping metal mold according to claim 2 in coincidence by transfer molding, the production process of the whole motor is simplified and structural dependability is raised.

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## DESCRIPTION OF DRAWINGS

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### [Brief Description of the Drawings]

[Drawing 1] It is the decomposition perspective view showing one example of the brushless electric motor of this invention.

[Drawing 2] It is the sectional view showing one example of the shaping metal mold of this invention.

[Drawing 3] It is the important section perspective view showing the application which changed rotator Brock's segment magnet.

[Drawing 4] (a) and (b) are the explanatory views of the shaping condition.

[Drawing 5] It is the important section perspective view showing the application which changed rotator Brock's York.

[Drawing 6] It is the cross-sectional view.

[Drawing 7] It is the decomposition perspective view showing the conventional example of a brushless electric motor.

[Drawing 8] It is the sectional view showing the conventional example of shaping metal mold.

### [Description of Notations]

1 Stator Brock

2 Stator

3 Magnetic Pole Child

4 Coil

6 Electric Wiring Plate

7 Magneto Induction Component

8 Resin Layer

11 Rotator Brock

12 Rotor Axis

13 York

14 Segment Magnet

15 Resin Layer

21 Bearing Stand

31 Female Mold

32 Pars Basilaris Osis Occipitalis

33 Method Peripheral Wall Section of Outside

34 Inner Direction Peripheral Wall Section

35 Thin Cylinder Object

41 Punch

42 Pars Basilaris Osis Occipitalis

43 Method Peripheral Wall Section of Outside

44 Fitting Projected Part

45 Method Injected Hole of Outside

46 Inner Direction Injected Hole

51 Pot

52 Molding Material



53 Plunger

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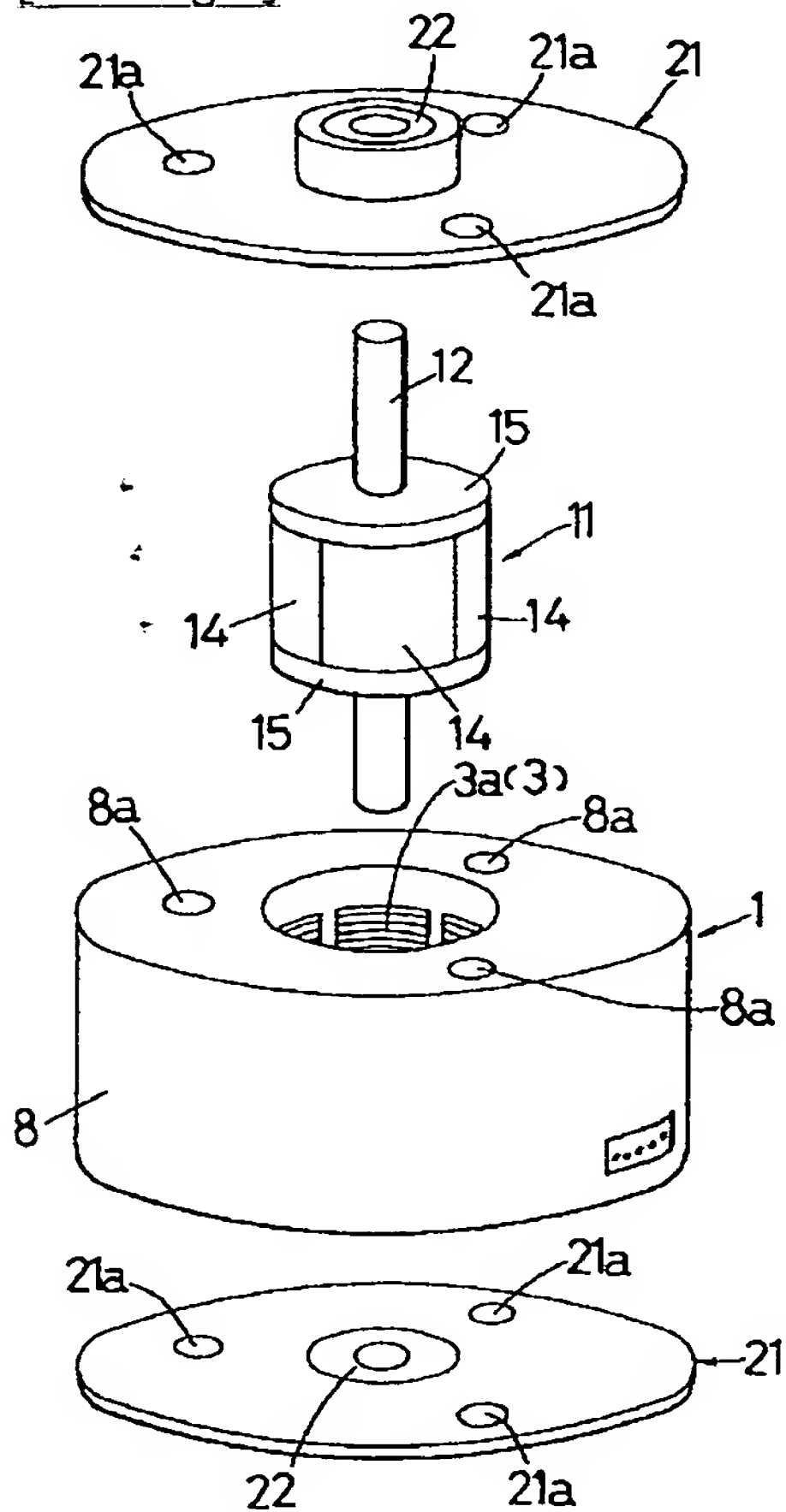
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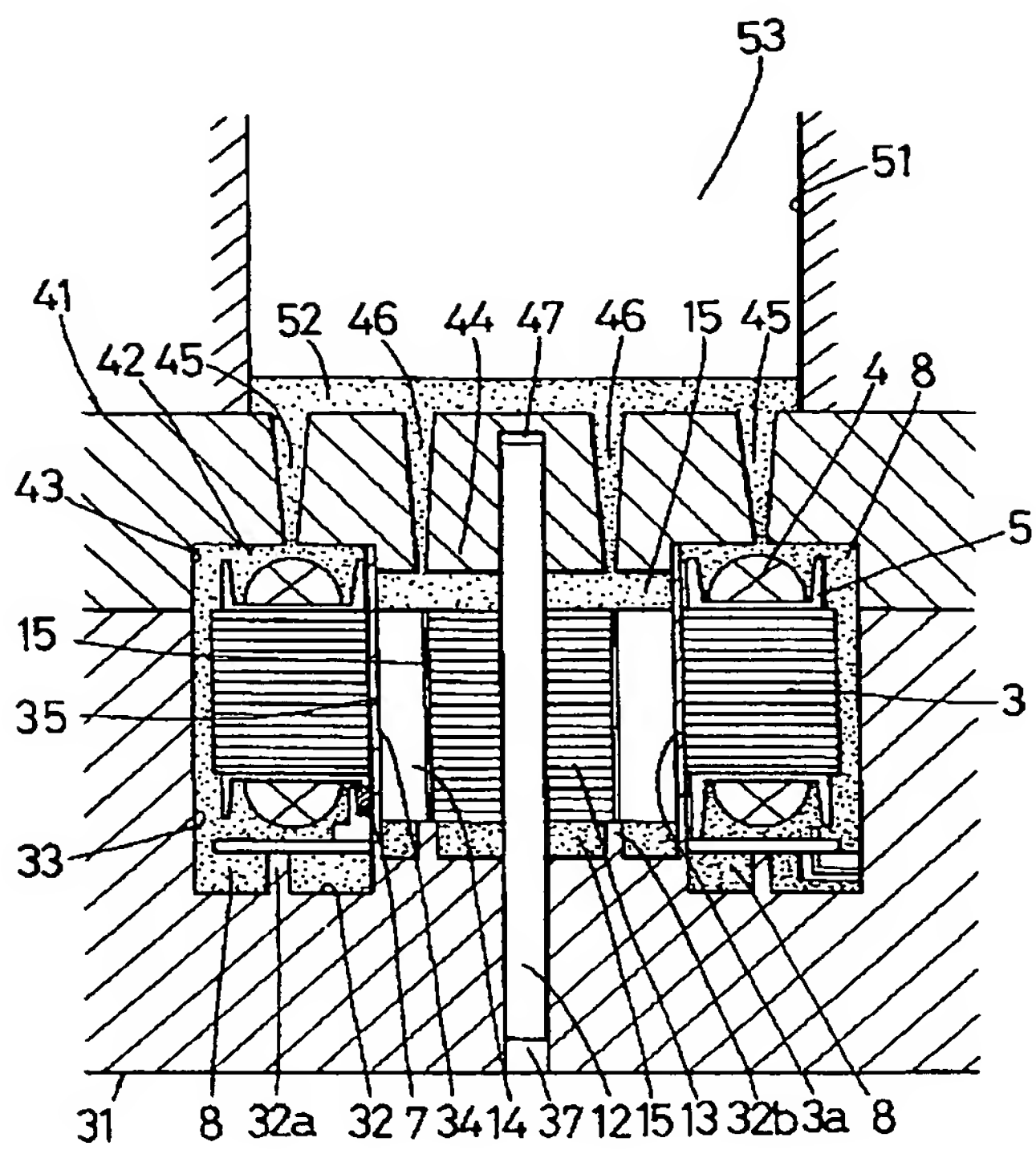
DRAWINGS

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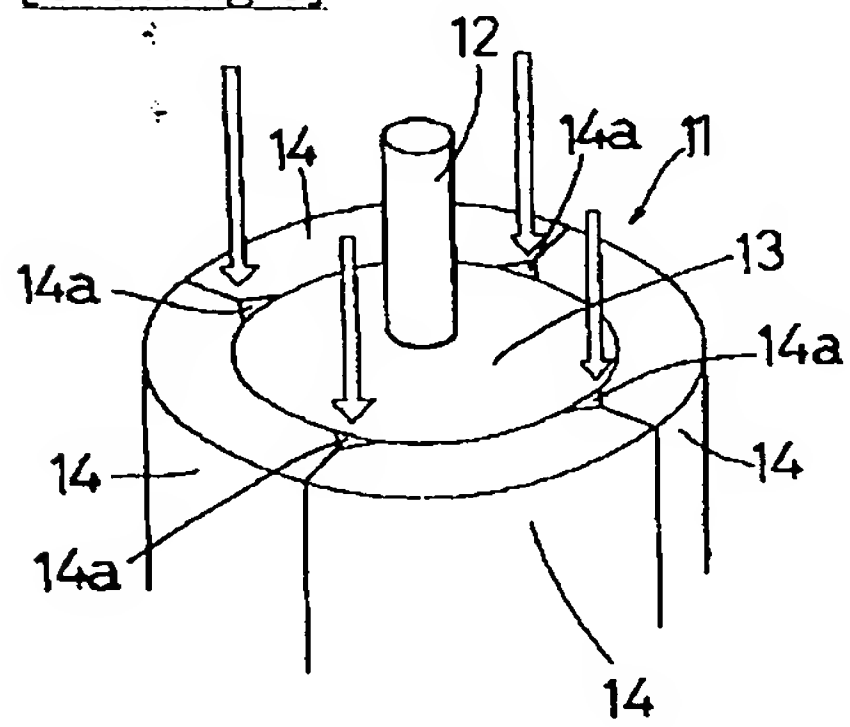
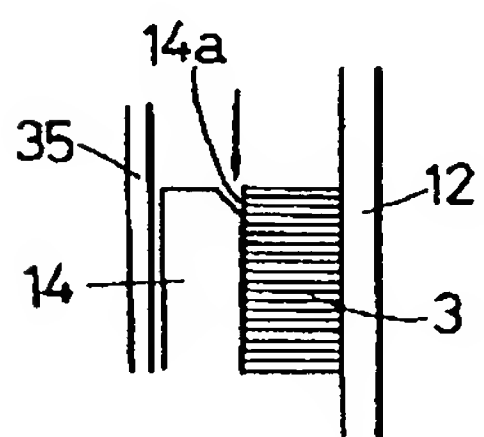
[Drawing 1]



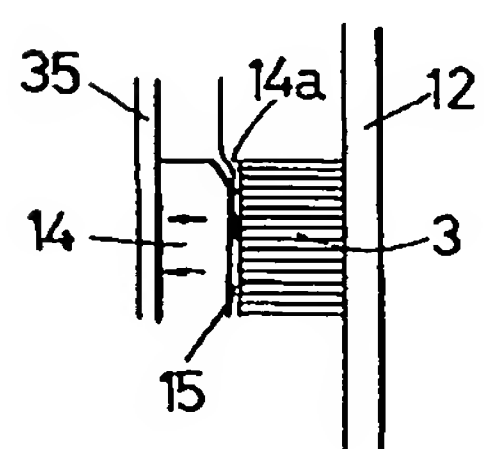
[Drawing 2]



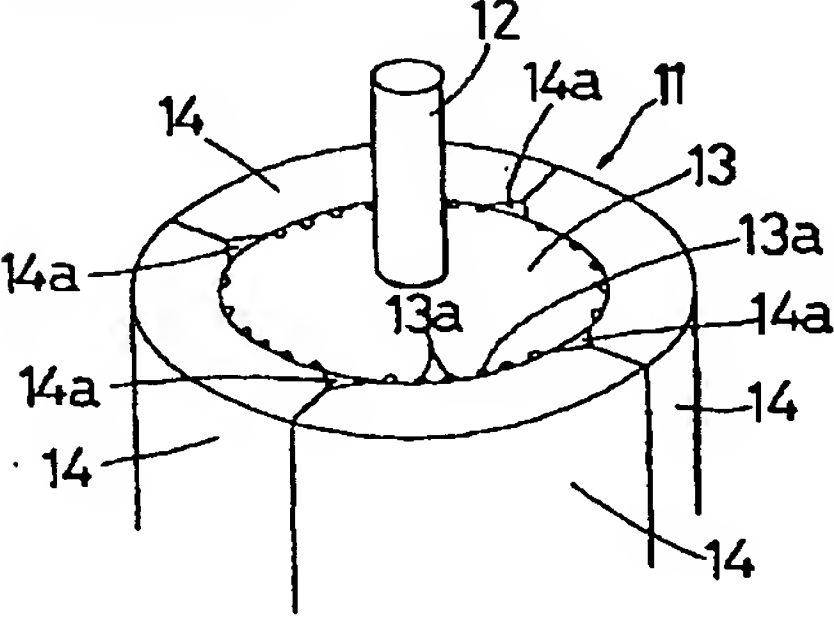
[Drawing 3]

[Drawing 4]  
(a)

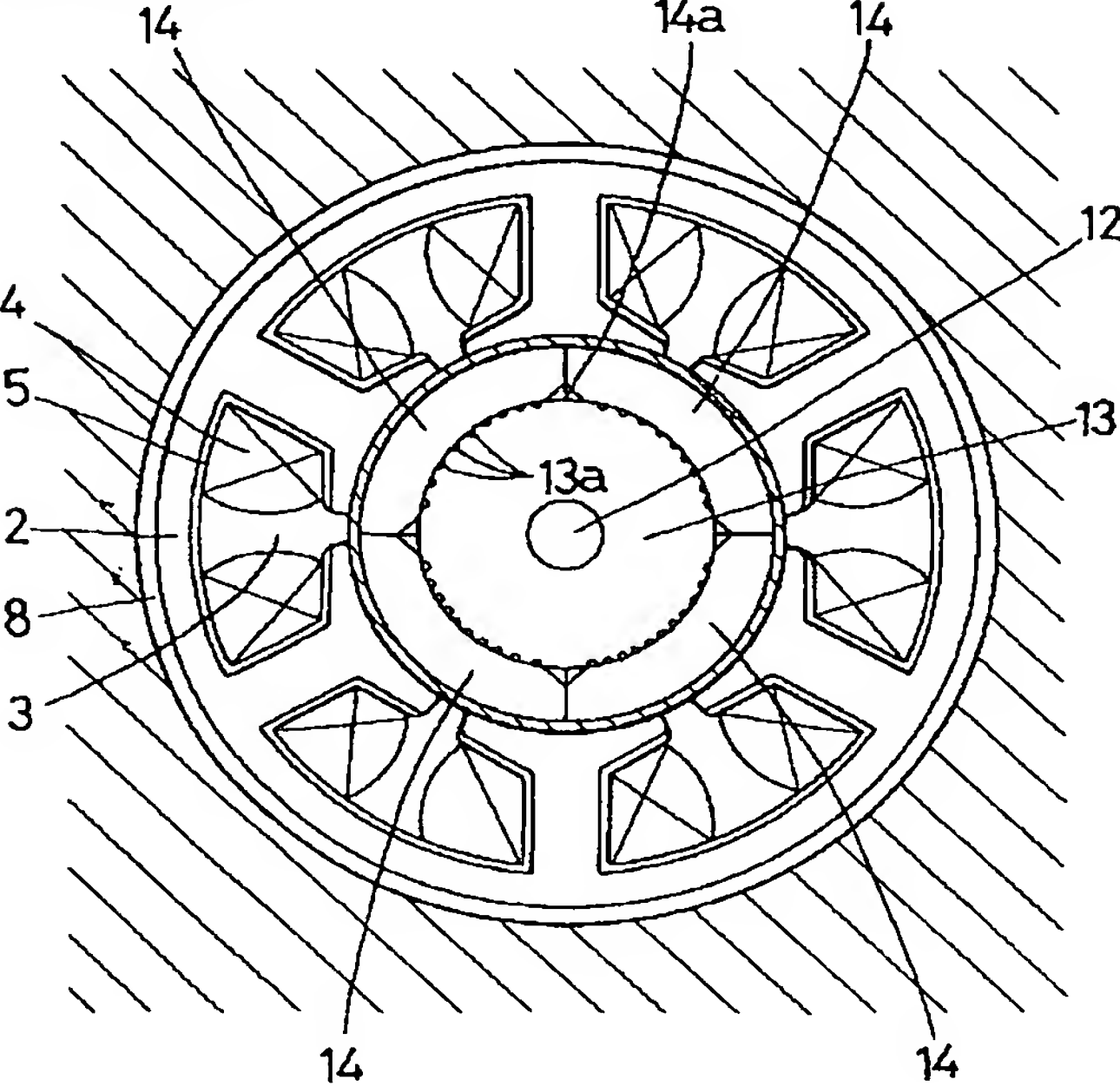
(b)



[Drawing 5]

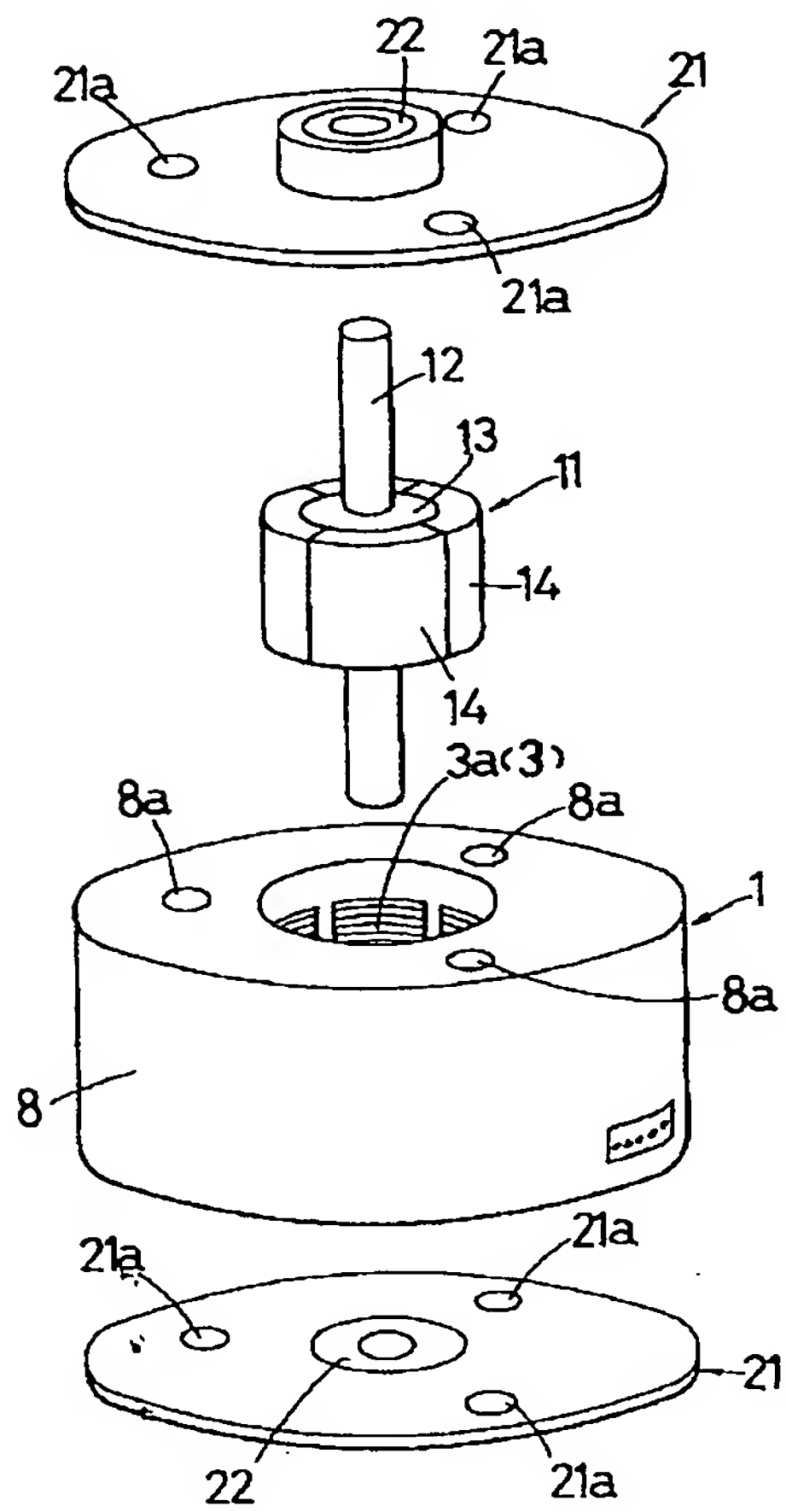


[Drawing 6]

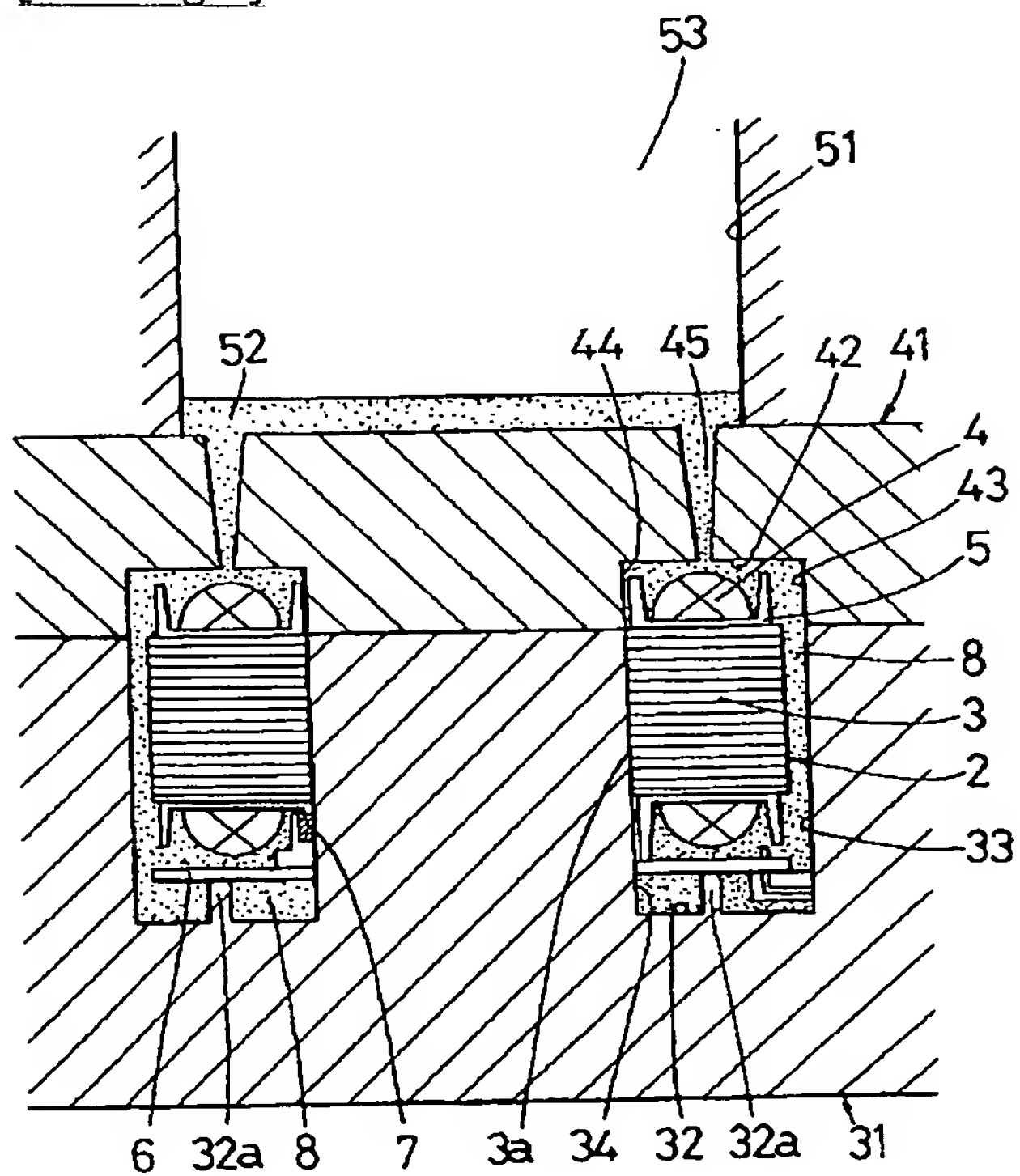


[Drawing 7]





[Drawing 8]



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(71)出願人 000005832

松下電工株式会社

大阪府門真市大字門真1048番地

(72)発明者 川本 哲郎

大阪府門真市大字門真1048番地松下電工株式会社内

(72)発明者 石田 洋介

大阪府門真市大字門真1048番地松下電工株式会社内

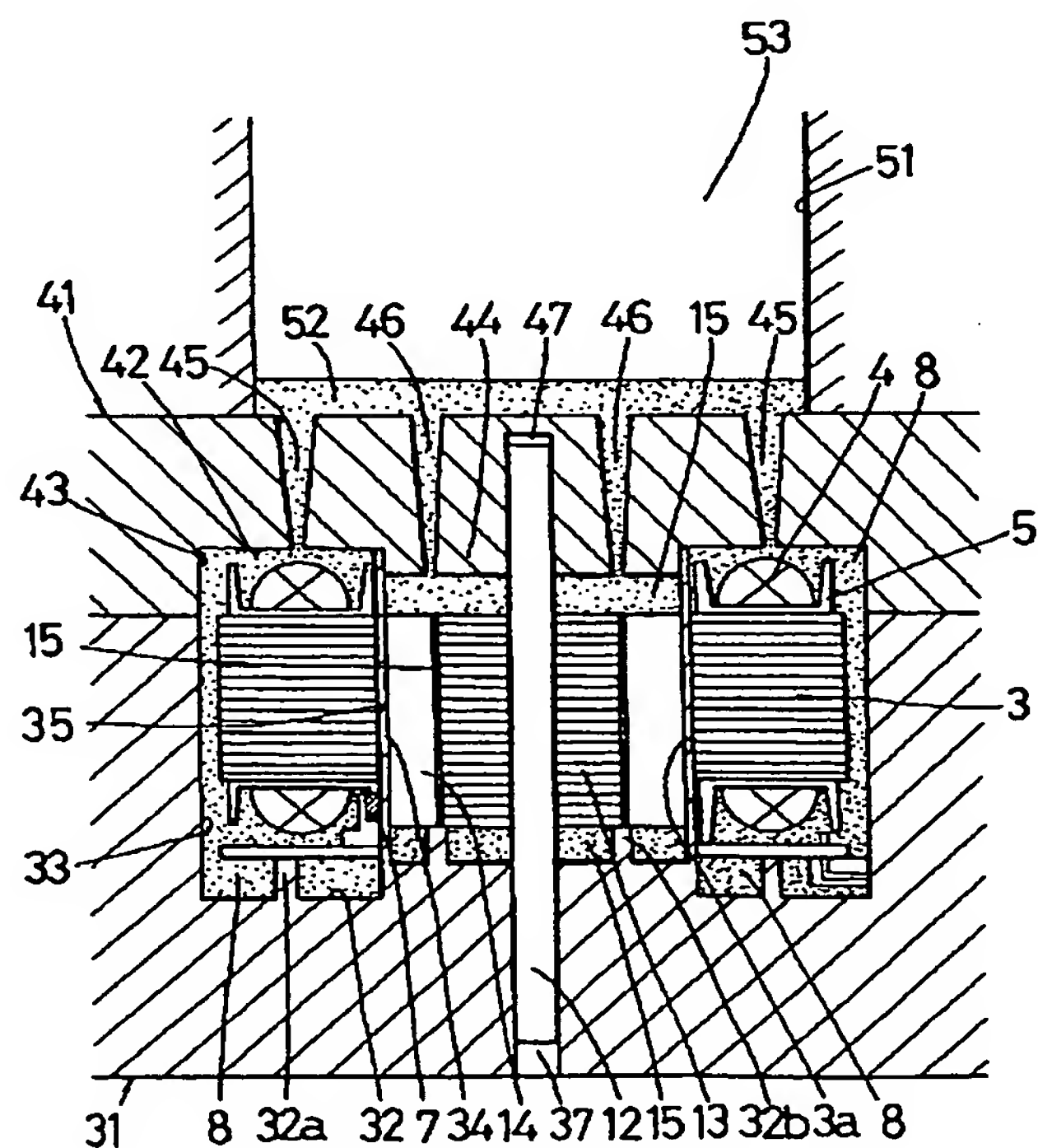
(74)代理人 弁理士 川瀬 幹夫 (外1名)

(54)【発明の名称】 無刷子電動機及びその成形金型

(57)【要約】 (修正有)

【目的】 回転子ブロックや電動機全体の製造工程を簡易化し、構造的な信頼性が高められる無刷子電動機及びその成形金型の提供。

【構成】 回転子ブロック11を、ヨーク13及びセグメント磁石14の軸方向両端面と、ヨークとセグメント磁石間に樹脂層15を形成してセグメント磁石をヨークに固着した電動機とし、回転子ブロックの外周面に対応する内方周壁部34を有しかつ磁極子3と回転子ブロックの外周面間の間隙に対応する厚さを有して底部32から立設された薄肉円筒体33を具備した下型31を有する成形金型とした。



る無刷子電動機及びその成形金型の提供にある。

#### 【0011】

【課題を解決するための手段】かかる課題を解決するために、請求項1記載の無刷子電動機は、鉄板を打ち抜き積層したものであって大略円筒状をなすとともに内周面に複数の磁極子を突設した固定子と、この磁極子の周囲に巻回されるコイルと、磁気感应素子やコイルの末端を支持接続する電気配線板と、を含み、磁極子の内周面を露出させてこれらを覆うよう樹脂モールドしてなる固定子ブロックと、回転子軸と、回転子軸の外周に固着した円筒状のヨークと、このヨークの外周に固着される複数のセグメント磁石と、よりなる回転子ブロックと、回転子軸を支持する軸受を有して固定子ブロックの軸方向両端に固定される軸受台と、を有する無刷子電動機において、前記回転子ブロックは、ヨーク及びセグメント磁石の軸方向両端面と、ヨークとセグメント磁石間に樹脂層を形成してセグメント磁石をヨークに固着した構成としている。

【0012】請求項2記載の成形金型は、固定子ブロック及び回転子ブロックの軸方向一端面に対応する底部と、固定子ブロックの外周面に対応する外方周壁部と、回転子ブロックの外周面に対応する内方周壁部を有しかつ磁極子と回転子ブロックの外周面間の間隙に対応する厚さを有して底部から立設された薄肉円筒体と、を具備した下型と、固定子ブロック及び回転子ブロックの軸方向他端面に対応する底部と、固定子ブロックの外周面に対応する外方周壁部と、径方向において固定子ブロックが存在する範囲に設けた外方注入孔と、径方向において回転子ブロックが存在する範囲に設けた内方注入孔と、を具備し、薄肉円筒体が嵌合する嵌合突部を底部に形成した上型と、を有し、両注入孔より樹脂を注入して請求項1記載の無刷子電動機をトランスファ成形する構成としている。

#### 【0013】

【作用】請求項1記載の構成によれば、ヨークに対するセグメント磁石の固着がトランスファ成形等によって形成される樹脂層によって行われるので、回転子ブロックの製造工程を簡易化し、構造的な信頼性が高められる。

【0014】請求項2記載の構成によれば、固定子ブロックと回転子ブロックが同時にトランスファ成形によって形成できるので、電動機全体の製造工程を簡易化し、構造的な信頼性が高められる。

#### 【0015】

【実施例】以下、本発明の無刷子電動機及び成形金型の一実施例を図1及び図2に基づいて説明する。なお、従来例の部材と実質的に同一の部材には同一の符号を付している。

【0016】この無刷子電動機は、従来例で説明したものと同様、固定子ブロック1と回転子ブロック11と軸受

台21を主要構成部材としており、従来例とはそのうちの回転子ブロック11のみが異なるものである。つまり固定子ブロック1は、内周面に複数の磁極子3を突設した固定子2と、磁極子3の周囲に絶縁部材5を介して巻回されるコイル4と、磁気感应素子7やコイル4の末端を支持接続する電気配線板6と、を含み、磁極子3の内周面3aを露出させてこれらを樹脂層8にて覆うよう樹脂モールドしてなり、樹脂層8には適数個の取着孔8aが設けられる。また2個の軸受台21, 21は、回転子軸12を支持する軸受22, 22を有し、さらに固定子ブロック1の取着孔8a, 8aに対応する取着孔21a, 21aを有しており、後述する回転子ブロック11を固定子ブロック1内に挿入し、回転子軸12を軸受22, 22に挿通させながら両取着孔8a, 21aを合致させてこれに図外ねじ等を螺着することによって固定子ブロック1の軸方向両端に固定される。

【0017】回転子ブロック11は、回転子軸12と、回転子軸12の外周に固着した円筒状のヨーク13と、このヨーク13の外周に接着等によって固着される複数（本実施例では4個）のセグメント磁石14, 14, 一とよりなる。さらに具体的には、ヨーク13及びセグメント磁石14, 14, 一の軸方向両端面と、ヨーク13とセグメント磁石14, 14, 一間に樹脂層15を形成してセグメント磁石14, 14, 一をヨーク13に固着した構成としている。またヨーク13及びセグメント磁石14, 14, 一の軸方向両端面に設けた樹脂層15, 15を含む長さは、固定子ブロック1の軸方向両端面に設けた樹脂層8, 8を含む長さよりやや短くしてある。

【0018】次に、このような固定子ブロック1と回転子ブロック11を形成するための成形金型について説明する。下型31は、固定子ブロック1及び回転子ブロック11の軸方向一端面に対応する底部32と、固定子ブロック1の外周面に対応する外方周壁部33と、回転子ブロック11の外周面に対応する内方周壁部34を有しかつ磁極子3と回転子ブロック11の外周面間の間隙に対応する厚さを有して底部32から立設された薄肉円筒体35と、回転子軸12の嵌入孔37を有している。薄肉円筒体35は、固定子ブロック1の端面まで延びており、従って突き合わせ面より突出する。底部32は、両ブロック1, 11の軸方向長さの関係より平坦ではなく、回転子ブロック11に対応する部分が少し突出しており、また軸方向一端面側の樹脂層8, 15の形成のために複数の支柱32a, 32bを設けている。ヨーク13とセグメント磁石14の設計にあたっては、セグメント磁石14が薄肉円筒体35の内方周壁部34に当接した状態で、両者間に所定の樹脂層15を形成し得る隙間が生じるようにする。さらに回転子ブロック11のための支柱32bは、ヨーク13とセグメント磁石14の両方を支えるようにする。

【0019】上型41は、固定子ブロック1及び回転子ブロック11の軸方向一端面に対応する底部42と、固定子ブロック1の外周面に対応する外方周壁部43と、径方向において固定子ブロック1が存在する範囲に設けた外方注

入孔45と、径方向において回転子ブロック11が存在する範囲に設けた内方注入孔46と、回転子軸12の嵌入孔47を有している。底部42は、両ブロック1, 11の軸方向長さの関係より平坦ではなく、回転子ブロック11に対応する部分が少し突出しており、これが薄肉円筒体35が嵌合する嵌合突部44となる。内方注入孔46は、ヨーク13とセグメント磁石14間の隙間に重なる位置に設けることが好ましい。

【0020】51は成形材料を収容するポット、52は不飽和ポリエステルのような成形材料、53は成形材料を押し出すためのプランジャであってこの成形金型はトランスファー成形の金型構造となっている。成形材料52の不飽和ポリエステルは、加熱溶融時の粘性が極めて低く、金型内の隅々まで、あるいは小さい隙間に確実に充填でき、また各部材との密着性も良好である。

【0021】この実施例の電動機は、固定子ブロック1の外径が約100mmΦ、軸方向長さが約20mm、回転子ブロック11の外径が40乃至50mmΦ、軸方向長さが約15mm、磁極子3の内周面3aとセグメント磁石14との間隙が約1mm、ヨーク13とセグメント磁石14間の樹脂層15の厚さが0.2乃至0.3mmとしている。

【0022】固定子ブロック1と回転子ブロック11の成形は、ポット51内に予熱した成形材料52をチャージし、加熱された上下金型31, 41を所定型締め力で突き合わせるとともに、プランジャ53の下降により成形材料52が両注入孔45, 46を通して金型内に充填され、ヨーク13とセグメント磁石14間にも充填され、それらが硬化すれば上下金型31, 41を開放して両ブロック1, 11が取り出す。

【0023】このように、固定子ブロック1と回転子ブロック11は同時にトランスファー成形により形成されるので、従来のものに比して回転子ブロックや電動機全体の製造工程が簡易化し、構造的な信頼性が高められる。また、両ブロック1, 11を別々に成形するようなことは考えられるとしても、それよりも製造工程が簡易化されとともに、常に必要数だけ成形することになるため数量管理も容易である。

【0024】図3及び図4は、回転子ブロック11の応用例で、セグメント磁石14の形状を変えている。すなわちセグメント磁石14は、1/4円弧板状をなしているが、その内周側の周方向端面を約45°の角度で切除した切除部14aを有している。このものは、成形材料52が注入されたとき切除部14aの斜面によってセグメント磁石14が外方に押圧され易くなり、より良好な成形が行える。図4(a)は成形材料52が注入される直前、(b)は成形材料52によってセグメント磁石14が外方に押圧されている状態を示している。

【0025】図5及び図6も回転子ブロック11の応用例で、先のセグメント磁石14の形状とともにヨーク13の形状を変えている。すなわちヨーク13は、外周面に多数の凹条13a, 13a, 一が形成されている。この場合は薄板のヨ

ーク片を打ち抜き積層するのが望ましい。なお、セグメント磁石14は切除部14aが無いものであってもよい。このものは、ヨーク13とセグメント磁石14との基本的な隙間は小さくし、その分凹条13aの幅と深さを大きくして成形材料52がより充填させ易くなる。

#### 【0026】

【発明の効果】請求項1記載の無刷子電動機は、ヨークに対するセグメント磁石の固着がトランスファー成形等によって形成される樹脂層によって行われるので、回転子ブロックの製造工程を簡易化し、構造的な信頼性が高められる。

【0027】請求項2記載の成形金型は、固定子ブロックと回転子ブロックが同時にトランスファー成形によって形成できるので、電動機全体の製造工程を簡易化し、構造的な信頼性が高められる。

#### 【図面の簡単な説明】

【図1】本発明の無刷子電動機の一実施例を示す分解斜視図である。

【図2】本発明の成形金型の一実施例を示す断面図である。

【図3】回転子ブロックのセグメント磁石を変えた応用例を示す要部斜視図である。

【図4】(a)(b)はその成形状態の説明図である。

【図5】回転子ブロックのヨークを変えた応用例を示す要部斜視図である。

【図6】その横断面図である。

【図7】無刷子電動機の従来例を示す分解斜視図である。

【図8】成形金型の従来例を示す断面図である。

#### 【符号の説明】

- 1 固定子ブロック
- 2 固定子
- 3 磁極子
- 4 コイル
- 6 電気配線板
- 7 磁気感应素子
- 8 樹脂層
- 11 回転子ブロック
- 12 回転子軸
- 13 ヨーク
- 14 セグメント磁石
- 15 樹脂層
- 21 軸受台
- 31 下型
- 32 底部
- 33 外方周壁部
- 34 内方周壁部
- 35 薄肉円筒体
- 41 上型
- 42 底部

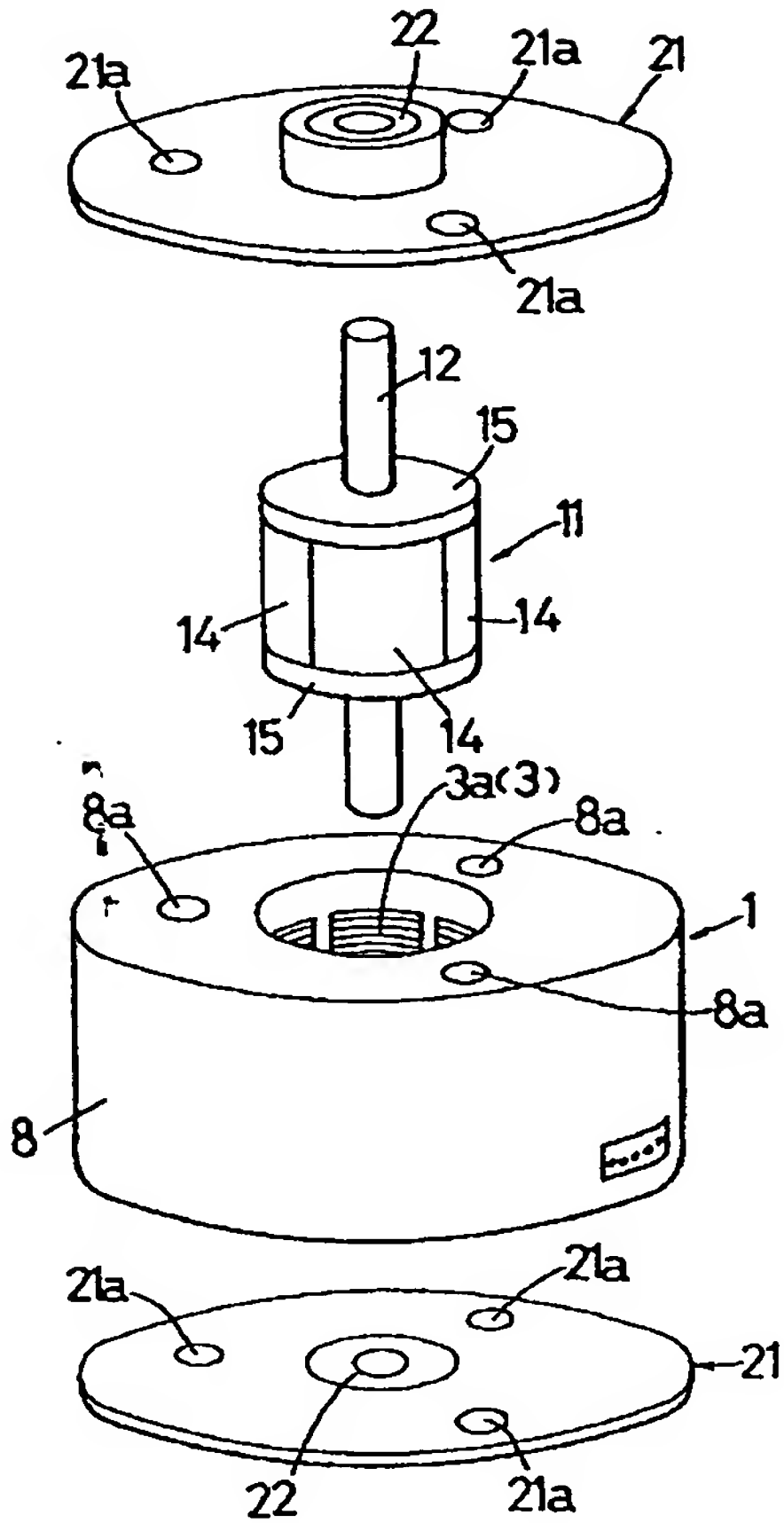


43 外方周壁部  
44 嵌合突部  
45 外方注入孔  
46 内方注入孔

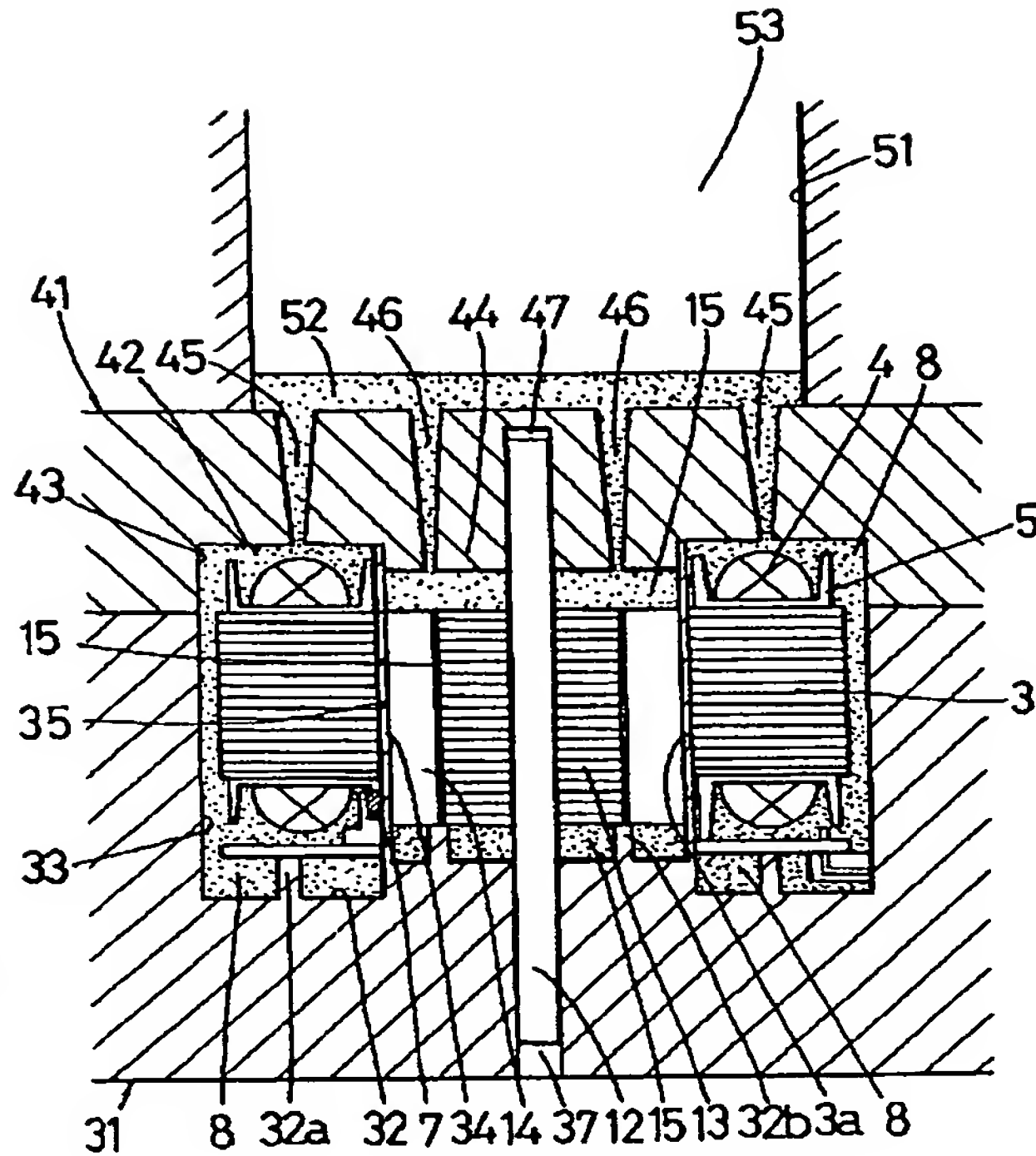
\* 51 ポット  
52 成形材料  
53 プランジャ

\*

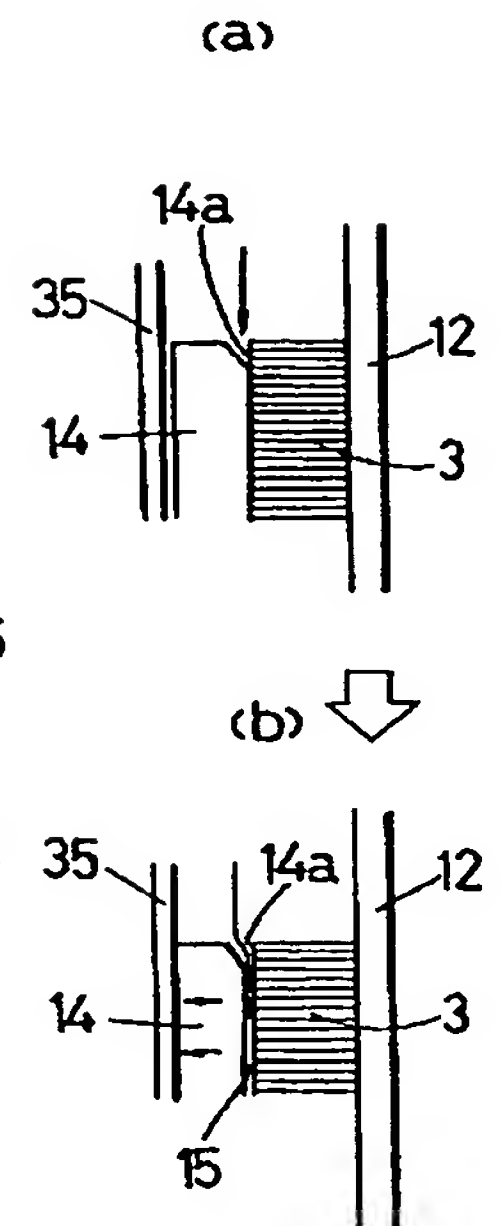
【図1】



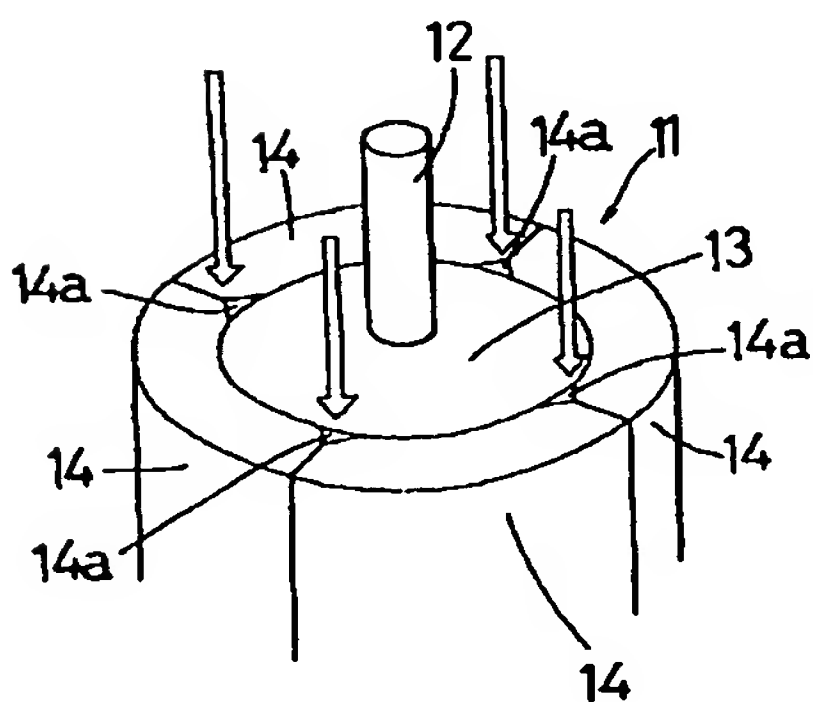
【図2】



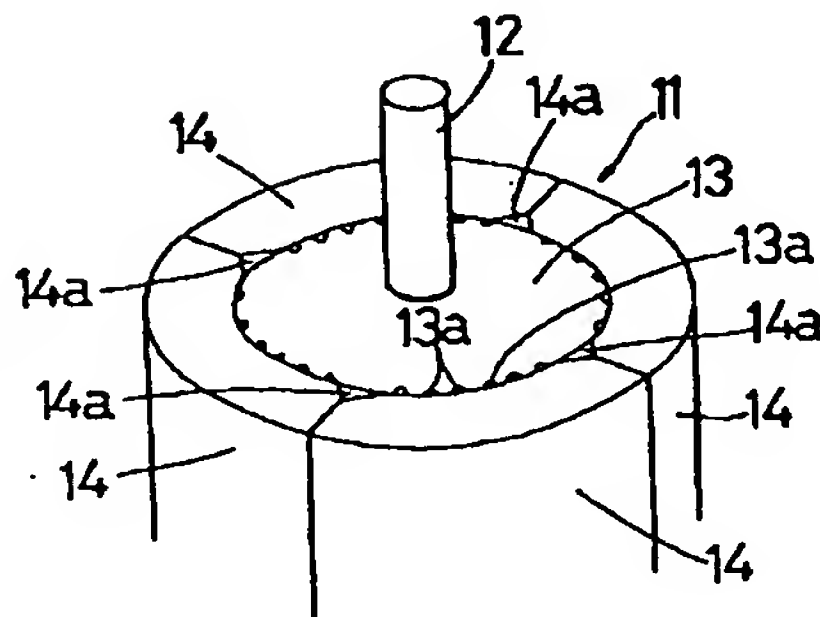
【図4】



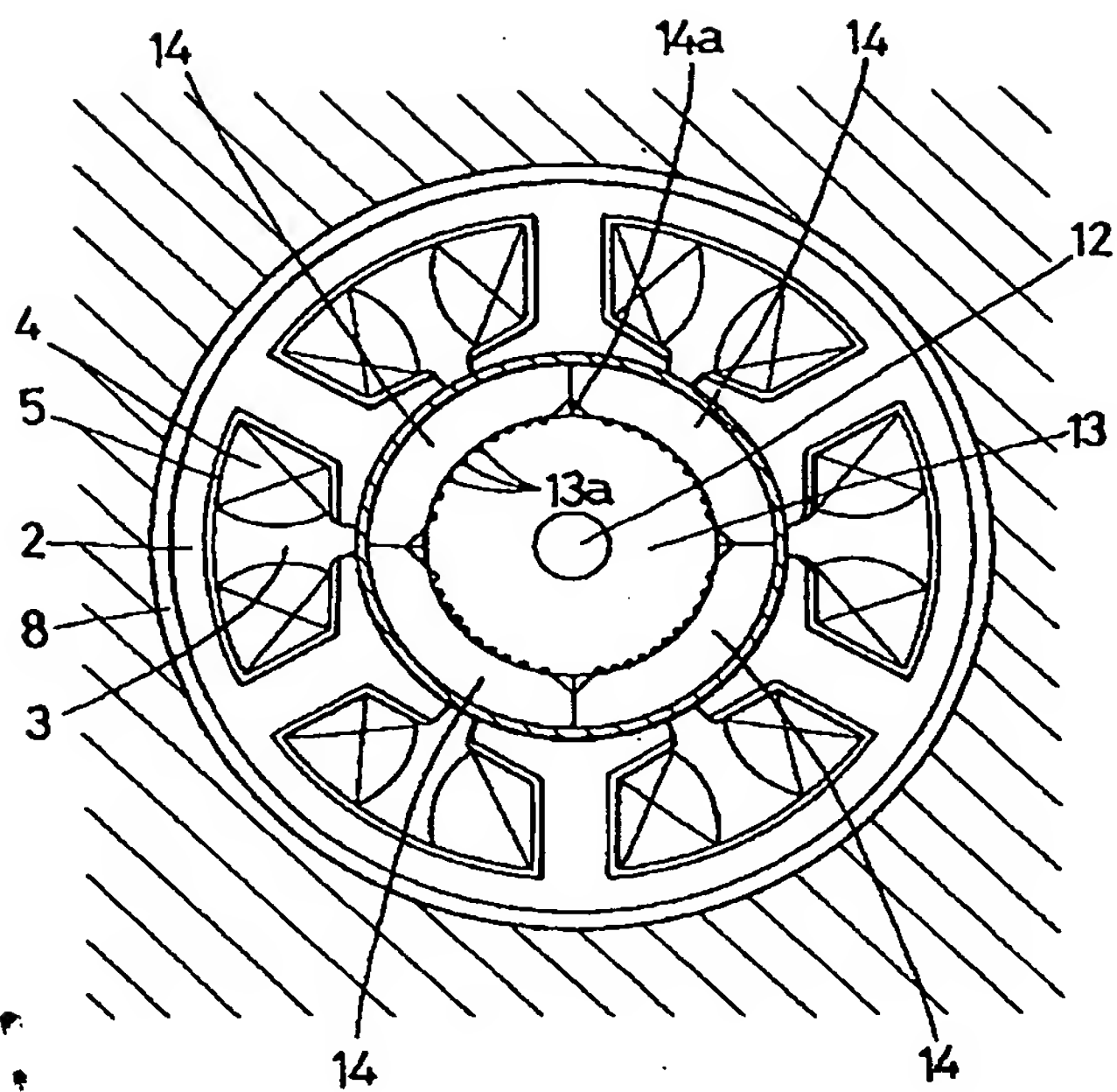
【図3】



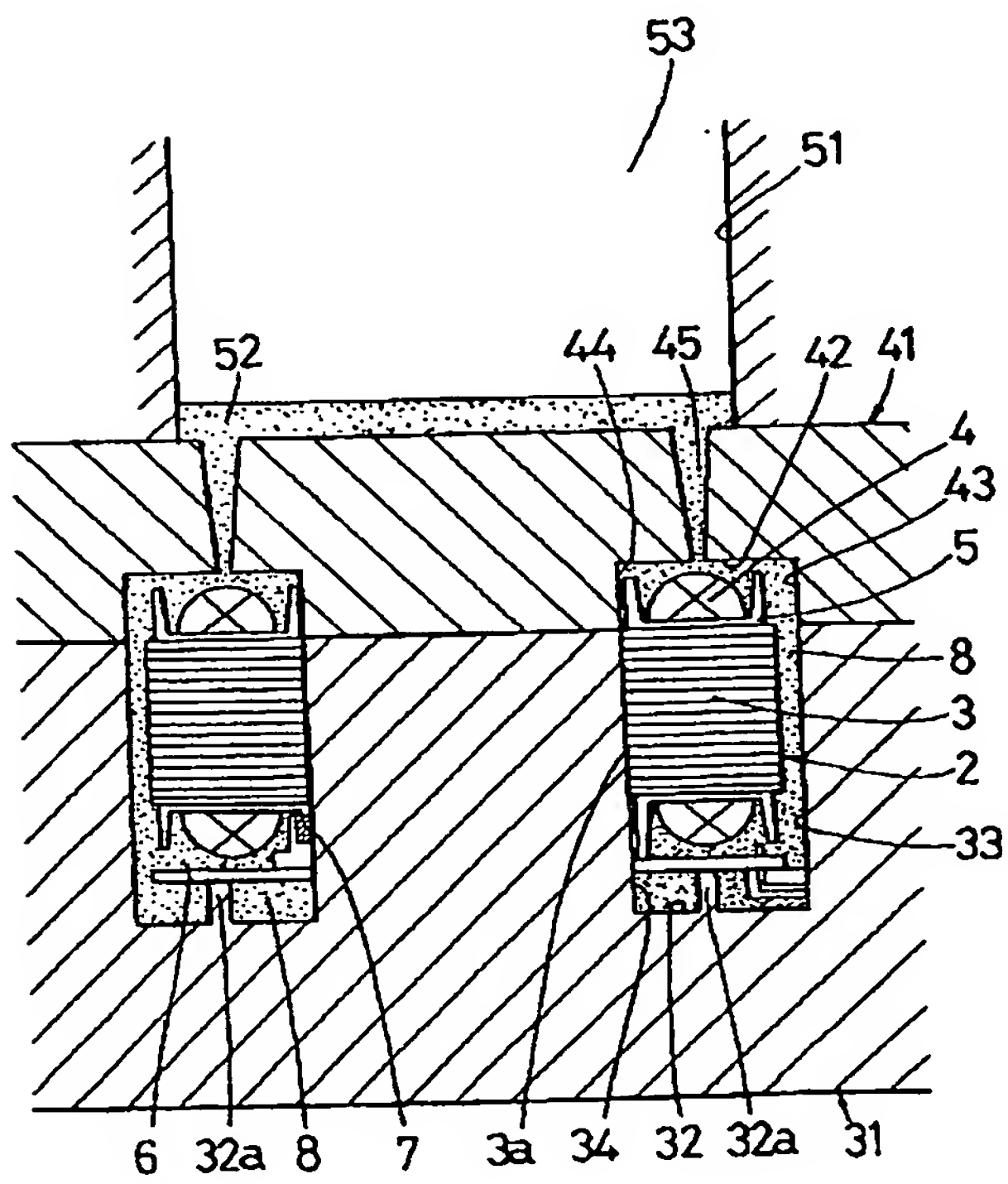
【図5】



【図6】



【図8】



【図7】

